SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

No. 1802.—Vol. XL. LONDON, SATURDAY, MARCH 5, 1870. {STAMPED .. SIXPENCE. UNSTAMPED, FIVEPENCE

Original Correspondence.

COAL BETWEEN THE SOUTH STAFFORDSHIRE AND SHROPSHIRE FIELDS.

SIR,—I notice in the Supplement to last week's Journal that Mr. Marcus Scott calls attention to a remark I made in reference to the above subject. It may have seemed somewhat abstruse. In speaking of the fault on the Shropshire side, I did so in connection with that one bounding the Staffordshire field—that is, where the Permians set in. I am quite aware that they have never found coal in Shropshire beyond the great Symon fault, yet Mr. Scott must be aware that they struck on a fault similar to that in Staffordshire, and supposed it to be the boundary of their coal field; but on driving through the fault they found coal, as I stated, and to some extent, before the Symon fault was reached.

I am glad of Mr. Scott's letter, as it occurred to me on reading it that that gentleman, with others, might give some valuable opinions and information upon the probability of coal existing between South Staffordshire and Shropshire, on my laying before them, through the medium of your Journal, the full particulars of the workings adjoining, and headings running into, the Staffordshire fault, which I have thoroughly examined, and of which I have full plans and sections. I will endeavour to let you have this information in a week or so, and as some of the explorations are of a very recent date any opinions will be considered a boon by landowners and persons connected with mines in this district. The subject, properly discussed, may be the means of saving thousands of pounds, by further opening up a large coal field, or by preventing useless sinking.

Dudley, March 2. —— COLLIERY ENGINEER.

LANDLORDS' INSPECTION OF MINES.

SIR,—Lord Elcho dwelt upon the circumstance that "Lord Granville, who was a great coalowner, might be leading the deliberations of another assembly, and might be called away to answer for carelessness on the part of some of his viewers or managers if an accident in one of his mines led to the loss of life." Why not? Why should the Elcho shield be thrown over Lord Granville any more than over plain John Brown, M.E., M.I.C.E., F.G.S., the manager of his lordship's collieries? The Mines Inspection Act defines the lessee of the coal to be the coalowner, but I would go a little further back; I would say that the proprietor of the coal is the coalowner deriving benefit from the minerals, and I say it is not unreasonable that that personage should recoup some of the profits which the lessee, or the lessee's manager, has made for him, if that manager, in so doing, has made a mistake, and laid himself open to damages in a civil court. A proprietor of coal is the same in the law as the proprietor of anything else, and if he by his operations injures a neighbour or the public, it is only by special clauses that he shifts the burden off his shoulders on to those of others.

If a landlord works his coal and manages it himself, and anyone by the fault of his management gets injured, the injured party will get damages from him. If a landlord has not money, or brains, or either, to work his coal field, but lets it to a party possessing these qualifications, called the lessee, if a party gets injured by the lessee's negligence the landlord would still be liable, only the lessee has taken the burden off his shoulders. If the lessee has the money, but wants the practical knowledge of colliery working, he employs a competent manager, with the requisite knowledge, whom we shall call Mr. Brown; and the law is that if a party be injured by Mr. Brown's negligence, Mr. Brown, and not the other two, must pay. Now, I cannot see that because the lessee, whom we shall suppose to be Lord Granville, because he wants practical knowledge, or the lessor, whom we shall suppose to be Lord Elcho, because he wants one or other of the requisite qualifications, should escape with impunity, and use John Brown to pick up the hot chesnuts.

Take the case of Machinery Accidents. In South Staffordshire, one engine draws for many pits. If the winding-drum were to get out of gear by the neglect of the engineman to fix the proper keys, and the rope runs wild, and kills or injures some one, who is to blame? Now, we have over and over again seen this kind of thing happen, and what is the lesson to be learnt? why this—that the best engineman will make this mistake, and that it is the manager who is to blame for not having some of the many well-known arrangements of machinery which would render a thing of this kind impossible. He ought have an engine for each pit, for instance. Is the manager to blame for permitting the faulty arrangement to be used? No doubt of it; but say the proprietor is in the position of the Earl of Granville, and the arrangement was in existence when John Brown entered. He found that to overturn all these arrangements would be a work of time, and cost perhaps far more money than the concern was worth, and so he determined to try by discipline and care to overcome a radical defect. Can anyone doubt that the manager should be relieved of civil damages in this instance? and yet in a court of law if the injured party had "a case," he might pursue the manager, take all his savings of him, while the lessee would escape.

Take a case of Ventilation. A manager decides on a system of ventilation, not the best that could be adopted under any circumstances, but the best that could be adopted under the circumstances—the circumstances being with a view to economy—and a man gets burned. Had the more complete arrangement been adopted, the accident might have been avoided. The manager would, in this case, be held liable in damages, if an action would lie, and the same result might happen as above. But it is not plain that in such a case the manager should be shielded by the lessee. And why? Because in both cases his course was determined by motives of economy—not to benefit himself, but to benefit the lessee and lessor. I think, therefore, if a lessee does not profess a practical knowledge of minerals, but gets the best man that can be got, and pays him handsomely to work his collieries, it is a guarantee that he will only make such mistakes as it is impossible for fallable man to avoid, and that the lessee should be responsible for any mistakes made by such a man. If a lessee do not employ sufficient men, and persons get injured thereby, he should be held criminally as well as civilly liable therefor.

But then one cannot avoid carrying the matter a little further, and saying that it is not Lord Granville, the lessee, but Lord Elcho, the proprietor, that is to blame, because it is in the proprietor's option if for the reasons stated he does not work his own coal, to let it to anyone he pleases, and he can make stipulations as to the mode of working the coal, and as to the comfort of the men, and he can take the requisite means of obtaining information on the subject. In short, the coal belongs to the proprietor. He can cause it to be worked on any plan he thinks proper, as it is worked for his benefit; and, therefore, I would parody Lord Elcho's words, and say—Lord Elcho, who was a coalowner, might be leading the deliberations of a meeting for providing better inspection of mines, and might be called away to answer for carelessness on the part of some of his lessees, viewers, or managers if an accident in one of his mines led to the loss of life. —— A COALMASTER.

LANDLORDS' INSPECTION OF MINES.

SIR,—The letter of "A Coalmaster," in last week's Journal, is entitled to great consideration, from the complete knowledge of the subject which is displayed in it; yet I do not quite agree with the writer that the owner of the soil is in any way accountable for the manner in which the workmen employed by the lessees of collieries are cared for. "A Coalmaster" infers that it is an advantage for the safety of the colliers that the minerals should belong to the Crown, although I think a comparison of casualties in this country and on the Continent have been shown to give the advantage of greater safety to the English system.

One would like to know, says "A Coalmaster," how far in the Elcho family estates the mineral tenants are held bound to attend to their workmen, and whether the clauses relating to working, put in on the landlord's behalf, are for the benefit of the collier or for the benefit of the proprietor. Now, in this respect it would, I think, be a case of "Landowners and Coalmasters are very much alike, especially Coalmasters," for to suppose that in putting in a clause on the landlord's behalf, any other object would be sought than the protection of the landlord's interest, is scarcely reasonable. The coalmaster considers, before signing a lease, quite as carefully the facilities for safe and profitable working as the landowner; and when bad roofs, excessively fiery seams, superabundance of water, or other objectionable circumstances, are even alleged to exist, the landlord knows to his cost that he has to make very adequate allowance in the terms of the lease of the royalty.

The object of Crown leases of minerals is not, in the opinion of "A Coalmaster," profit only; but I think this statement is not altogether borne out by facts, even in Belgium, though, assuming that it be, the conclusion to be drawn is not so satisfactory as could be wished, seeing that the fatalities are more numerous in Belgium than in England. Or, if we want a nearer example of the liberality of Crown leases, perhaps "A Coalmaster" would refer to those granted both by the Crown and by the Duchy of Cornwall, which is much the same, for the working of metalliferous mines. These leases are certainly not less exacting than those of private proprietors, and for a very natural reason—the representatives of the Crown or of the Duchy can better afford to wait for a lessee than the private landowner can.

But with respect to Crown leases for collieries, I think there is another reason why the fatalities would be at least as numerous in workings conducted under them as in collieries leased by private proprietors. In the case of negociations for a lease from a private landowner, the coalmaster urges that certain seams cannot be profitably worked with anything like safety, and they are, consequently, left unworked, and, perhaps, thus lost for ever; the mines are thus got without any great inducement to abandon safety for profit. But in the case of Crown leases, for so important a mineral as coal, it would be the imperative duty of the officer granting them to make it a primary condition that every ounce of workable coal should be got, and, at the same time, to see that no conditions should be introduced which would be injurious to the general industries of the country, by tending to increase the price of coal. This would necessitate such close dealing that far less margin would invariably be left to the coalmaster, who would, consequently, have additional inducement to sacrifice safety for profit.

I quite agree with "A Coalmaster," that the excess of fatality in Belgium may be traceable to excess of Government inspection, and that Government should only aim at all collieries adopting the rules in force at the best in the district. For this amount of inspection the Mines Regulation Act, 1870, at present provides, as the Government Inspectors and Secretary of State between them should certainly be able to obtain the adoption of efficient Special Rules, and a proper amount of attention to them.—*March* 2. A LANDLORD.

MINES REGULATION AND INSPECTION BILL.

SIR,—As was shown in the discussion on the second reading of this Bill, there are a few matters requiring some change. We might individually point out the deficiencies and suggest improvements, but the force of such expressions would be weak, compared with similar expressions emanating from the various associations connected with coal and ironstone mining. As Friday, the 18th instant, is fixed for going into Committee on the Bill, there is ample time for the council of the mining associations to call a *special meeting* of each of the institutes in England and Wales, and let the result of the deliberate discussion of each body be forwarded for presentation to Parliament. Who so likely to take this matter up? Who knows better the form legislation should take on this subject? And who knows so well the intimate working out of the details of mining as the members of the Association? A MEMBER OF THE MIDLAND INSTITUTE

March 1. —— OF MINING ENGINEERS.

COLLIERY MANAGERS.

SIR,—A manager with science, but without the practical knowledge of colliery workings, may be likened to a man with money and without brains. It is the practical knowledge that is wanted, and tact and observation, as well as science. They do not often go together; professors of engineering seldom build steam-boats. The ship captain is altogether different; he is away with his vessel for weeks, and no one can look over him, but a colliery manager is always at hand, and his colliery—*his ship*—can be examined at any time. The parallel would only be complete by putting a Government Inspector on board the ship. Another great difference is, that the coalowner has an enormous pecuniary interest at stake to make him look after his colliery, the shipowner has none; he insures his ship—who will insure a colliery? The colliery manager, above all then, wants to be a practical man, with strong common sense, to deal in a spirit of fairness with the men (who are not children, and ought to see that he does his duty to them), but with a strong leaning to his master's interest, such as was shown by the overman who, feeling that a slight explosion had happened, rushed with all speed to the suspected place; on reaching it—all blown—he expended what breath was left in him in making the all-important enquiry—"*Is* the horses safe?" D.

THE COAL MINES OF DENBIGHSHIRE, NORTH WALES.

SIR,—Of the twenty-eight collieries opened in Denbighshire the Wynnstay Colliery is one of the most extensive, the lessees being the New British Iron Company. The royalties are leased from Sir W. W. Wynn and Mr. Whalley, M.P. There are two pits sunk, 60 yards apart—the downcast, 16 ft. diameter, 307 yards depth to the Main coal; the upcast, 11 ft. in diameter, 413 yards depth to the Wall and Bench seam. These pits are walled throughout. This company have several other pits now disused, and the whole of the coal is raised at the Wynnstay pits—about 400 tons per day from each. The average output is 4500 tons per week, of which about 2000 tons is consumed at the iron and coal works.

The winding-engine for the downcast shaft has two 30-in. vertical cylinders, 5-ft. stroke, non-condensing, 15-ft. rolls for flat wire-rope, resting on two intermediate stone walls. There are four eccentrics, double-seat valves, parallel motion, and a steam-brake connected with this engine. It raises from the Main coal four tubs of coal in each cage, in two decks; the tubs hold 8 cwts. to 10 cwts. of coal. The cages run on two wood guides. Each of these cages is provided with Owen's safety-catch; the manager reports very favourably of them, though they have not here been put to a practical test, but they have elsewhere; and it is greatly to be desired that owners and managers of mines will adopt one or other of the appliances now partially used in our coal and ironstone pits, for the loss of life from shaft accidents has of late been most deplorable. The winding-engine at the upcast pit has two 33-in. horizontal cylinders, 5-ft. stroke; the rolls are 12 ft. and 16 ft. in diameter respectively for the landings, at 217 and 307 yards in depth. This engine is direct acting, has four eccentrics, and double-seat valves. It raises four tubs of coal in each cage, on two decks. Each cage runs on three wire-rope guides. There is no timber in the pit. There are eight boilers for the whole of the engines; five of these are Cornish, and four Lancashire. The pressure of steam is 40 lbs. A 12-in. vertical beam-engine pumps the top water, by means of a horizontal rod, one T-bob, and two sets of pumps, 6-in. and 7-in. buckets. Steam is also taken down the upcast pit from these boilers to supply the underground hauling-engine.

SECTIONS OF THE PRINCIPAL SEAMS OF COAL AND DEPTHS, AS FOUND AT WYNNSTAY COLLIERY.

Two Yard or New coal	5ft.	6in.	thick	280	yards deep.
Main coal seam, the best for steam purposes	9	0	"	307	"
Brassy seam	3	0	"	316	"
Upper Yard seam	2	2	"	326	"
Red coal, inferior	2	2	"	347	"
Stone coal	3	0	"	357	"
Half Yard and Benches	4	3	"	373	"
Yard coal, best house	3	0	"	393	"
Wall and Bench seam, good house coal	3	6	"	413	"

The Two Yard and the Main coal are raised principally at the downcast pit, and the Stone coal, the Yard coal, and the Wall and Bench seam are raised in the upcast pit.

SECTION OF THE TWO YARD SEAM.

Top coal good, with a thin layer of brass	4ft. 6in.
Benches left in the mine	1 8
Holing in bass below.	

SECTION OF THE MAIN COAL SEAM IN DIP WORKINGS.

Top coal, best, for house and steam uses	1ft. 10in.
Middle coal, for steam	3 8
Rock band	0 4
Bottom coal, for steam	3 3
Total	8ft. 9in.

The Rock Band is absent on the north side of the pits; on the dip side it is found, varying from 4 in. to 18 in. The Stone coal is 3 ft. 6 in. thick, including a stone band of 3 in. in the middle of it.

The Yard seam includes the Nant coal, inferior		3ft. 0in.
Bass		4 3
Yard coal		3 0
The Wall and Bench Seam, a good gas and house coal.	Wall	1ft. 0in.
	Shale band	0 3
	Bench	2 6
Total		3ft. 6in.

The dip is nearly south, 12 inches per yard.

The system of working these seams has been formerly by long wall, but under the present management the system is changed—it is stated with advantage—to that of driving out narrow work to the boundaries, and working off the pillars afterwards towards the pit. In the Main coal seam the levels from the engine plane, which dips south, are driven east and west of it every 20 yards, and holed between every 50 yards, called bolt-holes. The levels and bolt-holes are 3 yards wide, and the pillars left are 50 by 20 yards. The bolt-holes are driven down hill, the tubs of coal are drawn up by a windlass fixed at the top of each; two men and a loader in each place performing this work. The prices are 1s. 9d. per ton for the coal, and 5s. 2d. per yard in the levels; an additional rate is paid in the bolt-holes on every 10 yards advance. The objection to this system is the great length of brattice used for ventilating the levels; the bolt-holes ventilate naturally, and a new system is being adopted to obviate this objection. When the levels reach the boundaries the coal between them will be worked to the rise in breadths of 20 yards at once, called wickets in this locality. The Two-yard seam is being worked on the same principle, and in both the narrow work is in course of driving out to the extremities of the royalty. The engine-plane in the Main coal seam is 380 yards long. The engine is placed at the top of it, and 75 yards west of the downcast. It has two 14-inch horizontal cylinders, 3-ft. stroke, direct-acting; one 6-ft. drum for wire-rope; four or five tubs are drawn at once up the plane. The tubs are of wood, and flanged wheels, running on bridge rails.

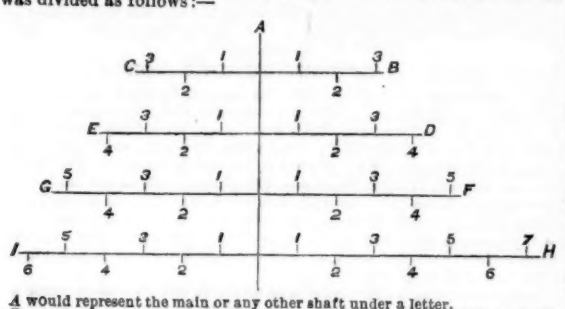
In the Stone coal, Yard coal, and Wall and Bench seams the levels and bolt-holes are driven 5 yards wide and upwards, of sufficient width to hold the debris produced, which is built up in the middle of the places, and thus forms two passages for the ingress and outlet of air, and dispenses with bratticing. These are the preparatory workings only towards the extremities, but in these cases a much larger proportion of the coal is got in the first working than in the Two-yard and Main coal seams. The Two-yard, also the Stone coal, Yard coal, and Wall and Bench seams are reached, and brought out generally by cross-measure drifts driven from the Main coal seam. About 650 men and boys are daily employed in the five seams underground

in this colliery; each is provided with a Belgian Mueseler lamp by the owners. Blasting is allowed in all the seams, and is performed by the miners. There are 18 horses employed in the whole of the seams underground. The ventilating agent is a furnace 9 ft. wide in the main coal seam, at the bottom of the upcast; it is supplied with fresh air; the returns have independent passages into the upcast. The quantity of air in circulation, including that passing over the furnace, at the time of my visit was 145,000 cubic feet per minute, but the quantity frequently reaches 160,000 cubic feet: 96 cwts. of slack is consumed at the furnace in 24 hours, equal to 2144 cubic feet of air per pound of coal used. The ventilator of Struvé was at work previous to furnace-power being used; the liability of the machinery to derangement, and the cessation of operations which immediately followed, is stated to be the cause of its being abandoned. A pit 15 ft. diameter is being sunk specially for an upcast, about 200 yards from the drawing pits. The circulation of air, on its completion, is expected to be greatly increased by the erection of two large furnaces, and the free upcast. The managers of these mines are strongly in favour of furnace-power for causing ventilation, and depreciate fans and machines for this purpose in no measured terms; but our experience with fans and duplicated engines goes to prove their efficiency, in respect of power and in regularity of performance.

Feb. 28. ——— MINING ENGINEER.

PREVENTION OF COLLIERY ACCIDENTS.

SIR,—Although a variety of schemes have been propounded at various times to reduce the serious accidents continually occurring in the colliery districts throughout the kingdom, and as they mostly arise from apparent neglect of either the men or overlookers, it has occurred to me that if a diary were kept in the office of the state of the air, gas, &c., and signed by the overlookers, according to the following plan, or something similar, it might be of some little service towards reducing the number of accidents, and aid in throwing light on a very dark subject. Suppose, in the first place, the colliery was divided as follows:—



A would represent the main or any other shaft under a letter.
B ,, ,, the upper level north, with the various drifts or goafs, numbered 1 to 3, &c.
C ,, ,, the upper level south, with the various drifts or goafs, numbered 1 to 3, &c.
D ,, ,, (say) the 50 fathom level north, with the various drifts numbered.
E ,, ,, (say) the 50 fathom level south, with the various drifts numbered.
F ,, ,, (say) the 100 fathom level north, with the various drifts or goafs numbered, &c.
G ,, ,, (say) the 100 fathom level south, with the various drifts or goafs numbered, &c.
H ,, ,, (say) the 150 fathom level north, with the various drifts or goafs numbered, &c.
I ,, ,, (say) the 150 fathom level south, with the various drifts or goafs numbered, &c.

Distinct books or diaries for every letter should be kept, as follows:—

1870.	Thermometer.								Velocity of air per feet.	Gas.	Observations.	Signature of overlooker.
Feb. 28	*B*	1	2	3	4	5	6	7				
3 A.M.		o	o	o	o	o	o	o				
6 A.M.		o	o	o	o	o	o	o				
9 A.M.		o	o	o	o	o	o	o				
12 A.M.		o	o	o	o	o	o	o				
3 P.M.		o	o	o	o	o	o	o				
6 P.M.		o	o	o	o	o	o	o				
9 P.M.		o	o	o	o	o	o	o				
12 P.M.		o	o	o	o	o	o	o				

GAS—S, strong; M, moderate; W, weak.

As soon as the overlookers come to the surface they should go direct to the office, where the different books, lettered according to the levels or drifts, would lie on the desk for them to enter the state of the thermometer (which I assume should be placed in some safe place in every level), the air and gas in the workings every third hour of the day, so that the principals, Government Inspectors, and clerks in the office should know the condition and safety of the different workings every three hours, and for each overlooker to attach his name to the report. The book should contain 365 leaves, and be ruled according to the above plan. A map or chart, something on the plan of the Royal National Life-Boat Institution barometrical chart, should be hung up in the office, and a copy placed on the window, or some other conspicuous place, for the colliers to see, with all the levels lettered, so that by this plan full information can be obtained at a glance of the state of the whole of the underground workings; and, by appointing one overlooker (say) for levels *B* and *C*, and another for *D* and *E*, it would then be to their interest to make what I should call "a good book," by showing their vigilance in examining and reporting the state of the workings under his command, and a reward should be given to that man who can show the best book—that is, with fewest accidents—at Christmas.

I hope these ideas may form the foundation of further improvements and extension of the diary; and should it meet with approbation it will be a source of satisfaction to me that I have contributed some little towards alleviating the distress caused by such severe accidents as are now constantly taking place in the colliery districts.

Glo'ster Hall, near Aberystwith, Feb. 28. J. G. WILLIAMS.

THE EDUCATION OF MINERS.

SIR,—In moving the second reading of the Mines Regulation and Inspection Bill, Mr. Bruce is reported to have said, with reference to the education of miners:—

"A few efforts had doubtless been made in Cheshire, Lancashire, and Cornwall to establish schools for mining agents, but those efforts had not been successful."

It appears of the utmost importance, so far as Cornwall is concerned, that this statement should be corrected. For a period of ten years the Miners' Association of Cornwall and Devonshire has been carrying on its work of educating the working miner in those branches of knowledge which have a direct bearing on practical mining. Classes in which chemistry, mineralogy, the theory of mining, and practical geology have been taught have been during all that time, and are now, in operation in the most active mining centres of Cornwall. At the present time, in the mining districts of Camborne, Gwennap, Helston, and St. Just about 100 young men are, when relieved from their subterranean toil, engaged in the study of the above-named sciences. The annual examinations of the Department of Science and Art will show how successfully those studies have been prosecuted. Many of the young miners have achieved a first class, and one of them, still working in the mine which pierces the bed of the Atlantic Ocean, receiving the gold medal for mineralogy.

Perhaps the best example which can be given as showing the desire for knowledge among the Cornish miners is a statement of the sum which has been paid by them for books on science during the past year, to enable them to continue in the quiet of their homes the studies to which they have been introduced by the lecturers in the class-rooms of the association. The association obtaining books at the full trade allowance, supplies them to the members of its classes at such a still further reduction, that the miners obtain them at a little above half the published price. During the past year these hard-handed men have been supplied with more than 100*l.* worth of books, for which, under the above conditions, they have paid from their scanty wages.

The reports of the association will show how earnestly the work of science education has been carried on in Cornwall. Notwithstanding the sad depression of the mining interests, and the consequent suspension of the subscriptions from many of the mines, this association has struggled onward, and, under the presidency of Mr. John St. Aubyn, one of the members for Cornwall, and the support of Lords Falmouth and Robartes, and other gentlemen interested in the mining industries, it is still successfully carrying forward its work of education, though the income at the disposal of the Council is exceedingly small.

The success of the Miners' Association of Devon and Cornwall has been due entirely to the system of taking the school to the miner, instead of requiring the working man to come to the school. Two experiments made to establish a mining school at Truro failed, but from the time when the system was organised for sending the teacher to the mines, success has attended the labours of the Miners' Association.

ROBERT HUNT, F.R.S.,
Hon. General Secretary of the Miners' Association of Cornwall.

INSPECTION OF METALLIC MINES.

SIR,—With the best intention to do good, no doubt, Lord Kinnaird has, I fear, taken a step which will prove obstructive to the working of the Mines Regulation Act, 1870, and ineffectual to accomplish the object his lordship has in view—that of securing greater safety and health in working metallic mines. It seems to me that his lordship has scarcely given the Mines Regulation Act, 1870, the attention he should, or he would have seen that it would have been far more desirable to have sought the amendment of the original measure rather than introduce a bill which in some cases clashes with it, and in others enacts the same thing. I admit that the circumstances in all mines are not absolutely identical, but I am convinced that they are so nearly similar that all should be governed by one Act of Parliament. It is the placing of two mines, perhaps nearly adjoining each other, under different laws that has led to so much difficulty and annoyance already; and yet, now that Mr. Bruce is endeavouring to remedy the evil, Lord Kinnaird, is, I am sure unintentionally, throwing an obstacle in the way.

In Lord Kinnaird's Bill the short title and interpretation clauses may be passed by for the present, because, if the Bill be unnecessary, the short title will be equally so, and the interpretation is already provided for. Lord Kinnaird's general rules are only those of Mr. Bruce with verbal modifications, and the addition of two or three rules to Mr. Bruce's would probably meet all Lord Kinnaird's wishes:—

Every part of a mine (other than a coal mine) used, or which may be used, as a footway in passing from one part of the mine to another part thereof shall be fenced.

Sufficient accommodation shall be provided by the owner of every mine within 100 yards from the principal footway or entrance to the mine for enabling every miner employed thereat conveniently to dry and change his dress.

Iron tamping-rods and prickers shall not be used for preparing holes for blasting in any mine.

The remainder of the general rules and the provisions for the establishment of special rules are unnecessary, as those contained in Mr. Bruce's Bill would be equally applicable to all mines. Lord Kinnaird suggests that iron tamping-rods should not be used for boring holes, but this injunction would probably be obeyed without Special Act of Parliament. The only other clause in Lord Kinnaird's Bill which need be referred to is that which gives powers to restrain working by injunction or interdict; this might, perhaps, be advantageously introduced in the Mines Regulation Act, 1870:—

Any of Her Majesty's superior courts of law or equity may upon the application of the Attorney-General, if in England or Wales, and upon the application of the Lord Advocate, if in Scotland, acting respectively on behalf of the Secretary of State, prohibit by injunction or interdict, as the case may be, the working of any mine at which it is alleged and proved to the satisfaction of the Court that, notwithstanding the prohibitions and penalties or other remedies provided to the contrary, the mine cannot be worked with due regard to the health and safety of the miners employed in working the same, or that the provisions of this Act are so habitually violated at such mine as to defeat the objects and purposes of this Act; and the Court may award such costs in the proceedings, and may also impose such restrictions and penalties under recognisance or bond, or otherwise as the Court thinks just.

Now, with regard to Mr. Bruce's Bill, the parliamentary committee of the Miners' National Association state that it will not suit the wants of the mining population, because (1) it does not provide that inspection shall be extended to all iron, stone, shale, and coal mines; (2) it does not contemplate a thorough inspection "such as the miners have long desired;" (3) the hours of labour for the young may be fourteen per day; (4) the truck system is not touched, and there is no provision for weekly pays; (5) education of children is no longer a necessity; (6) weighing is not made imperative—the obnoxious system of measuring and gauging may be continued; and (7) it is not made imperative that there should be trained manager of mines, collieries, and pits. From this it would appear that the removal of the words "coal and ironstone" wherever they occur before "mines" in Mr. Bruce's Bill would meet some of the miners' objections, and render the greater proportion of Lord Kinnaird's Bill unnecessary. Of course, there may be some other trifling modifications requisite to make the Bill applicable to all mines, but they will be quite unimportant.—*Truro, Feb.* 28. ——— COPPER.

LORD KINNAIRD, AND METALLIFEROUS MINING.

SIR,—Lord Kinnaird has again introduced his most mischievous Mines Bill into the House of Lords, evidently for no other purpose than either to shut up all metalliferous mining, or to fearfully increase the difficulties with which this branch of industry has to contend; and, as a consequence, must inevitably still further pauperise the working miner, or drive him out of the country entirely.

The idea of getting "every part of a mine and its machinery" officially inspected and reported on daily is—to put the very best possible construction on it—worthy of the innermost recesses of a lunatic asylum. And then, in case of *non*-compliance in this and many other such absurdities, to be handed over to the tender mercies of the Secretary of State and the superior courts, is eminently characteristic of the author of the measure. I hope both the landowners and miners will not be slow to stir in the matter on this occasion as on the last. ——— A MINE AGENT.

THE MINING DISTRICTS OF SHROPSHIRE—No. II.

SIR,—Since writing the letter which appeared in the Supplement to last week's Journal, another application, one by Mr. Gladstone, of Liverpool, cousin to the Premier, has been made for mining ground in the Shelve district; so that attention is evidently being directed to the Shropshire mines by others than natives of the county, and by men, it appears to me, of larger enterprise than many who have hitherto worked them. Several gentlemen interested in Cornish mines are among those with whom an interest has been created, and some of the managers of the mines also are Cornish men, like Capt. Waters, who in addition has had experience both in Australia and in America. It is not unfrequently the case that a run is made upon a district in consequence of some professional puff, put forth for the purpose of raising the value of the shares in the market, or that of keeping them up when at or above par, and that men rave about the riches of an El Dorado here or there whose theories and speculations are as visionary as if the places where they are to be found were fixed in the moon; and, as a natural consequence, the rational and steady going portion of the community come to their own conclusions as to their absurdity, and, excepting clergymen and old women, there are few who will have anything to do with them. As I have already said, I neither have any interest myself in any mine, nor am I influenced by anyone who has; and I simply seek to place a few general thoughts and impressions with calmness before the reader.

The country is one where mining operations have been carried on from very remote periods, as indicated alike by the form of the mines themselves, and by the primitive character of the tools found in them. You see heaps of dead stuff on the surface piled up, and looking like rude earth works, which show the direction the burrowings of human moles in search of lead have taken. The direction, of course, is that of the lode or crack, or opening in the rock, the result of the convulsion that created it, and in which rent or crevice Nature has usually irregularly deposited her mineral wealth. These crevices or lodes are rarely, if ever, filled with the ore itself, which is generally distributed and scattered in veins or bunches, where it lies associated with quartz, shale, or other substances. It is, of course, impossible to point out the exact direction a lode might take, but experience and the general character and appearance of the ground are sufficient to warrant experiment and expense of the usual plans of working. There seems reason for believing, however, that former mining operations have there been limited too much to the surface, and that sufficient capital and enterprise to make deeper searches in many instances have been wanting. The fact is the principles by which the accumulation of ore in lodes or veins have been regulated are little understood, and the prosecution of mining enterprise is now almost as much a matter of chance as it was with the Romans when they worked these same mines, nearly 2000 years ago. There are great exceptions, for some of the present captains appear to be thoughtful and intelligent men—men of natural shrewdness and great experience, men who have gained stores of knowledge in other districts, and who can collate facts as they find them here with those they have witnessed elsewhere. Still, the science of mining will never be complete till a proper system of technical education has been adopted, to convey a knowledge whereby these useful minerals have been formed and may be obtained. It is quite true that, although a combination of geological and mineralogical knowledge is necessary, it is not always the case that the phenomena of these lodes, with their heaves and dislocations, their different appearances, their boundaries, &c., can be understood.

Madeley, Salop, March 1. ——— JOHN RANDALL, F.G.S.

LEAD MINING IN SHROPSHIRE.

SIR,—The lead-bearing ground in Shropshire is in the Minsterley district; the lodes occur in the lower Silurian formation in the clay-slate of the Llandilo flags. Snailbeach—the oldest of the Shropshire mines—has been in operation about 70 years, and is now being worked at the depth of 400 yards. Others—Central Snailbeach, Perkin's Beach, Stiperstones, Roman Gravels, and Oven Pipe—are of more recent origin, though lead ore is said to have been worked and smelted during the time of the Roman occupancy of this country. The Oven Pipe Mine, the property of Mr. Heighway Jones, was purchased five years ago. After working it for two years on the old lode with slight success a cross-cut was driven northward, which cut what is called the new lode, the working of which has proved highly remunerative to the owner, and the prospect of its continuing to be profitable increases as the working is extended downward.

One shaft is used for raising materials and for the pumps. The shaft is vertical the first 48 fms., and is inclined for 53 fms. below that. The adit is 27 fms. down from the surface, where the water from the pumps flows away in winter, in summer the water is raised to the top of the pit for the purpose of washing the ores. The levels which occur below the adit, and the depth is reckoned from that, are the 21, 42, 52, 62, 71, 84, and 92 fm. levels. The inclined shaft terminates at the 74 fathom level, and the pumps also. The lead-bearing ground is worked chiefly from the 74, 84, and 92 fm. levels. The ore from the two latter being raised by winzes sunk from one level to another. The lead ore and material mixed with it (clay-slate and spar) are raised by one kibble, sliding on deals in the inclined shaft attached to a single linked chain. The engine on the surface, about 30 yards from the pit, is a 16-in. cylinder, beam-engine, 3½-ft. stroke, on second motion. It raises ore in the shaft from 6 to 2 P.M., crushes ore from 2 to 5 P.M., and pumps water from 6 to 6 A.M. There are four lifting sets of pumps from the 74 fm. level to the adit, the lowest is 7-in. bucket, the others are each 7½-in. bucket. From the adit to the surface a forcing set—7½-in.—is used or not, as required. The miners, about 50 in all, work in three turns in 24 hours, eight hours in each turn, and they descend and ascend by ladders, placed almost vertically in the pumping division of the vertical part, and inclined with the lode in the part below. The levels are driven nearly east and west, and the hade or dip is northward. The ore from the lode is worked principally downwards, in stopes of 6 ft. deep in succession between one level to the next below, the upper level being boarded over for the tramway, and the material from below raised up to it by windlasses. Blende, from which zinc is manufactured, mundic, and barytes are associated with lead ore in this lode, and are all saleable articles.

After being brought to the surface, the galena and stone mixed with ore is separated from the barren material brought up with it; the former are afterwards crushed separately with a pair of rolls. The crushed material is run into a rotary screen, the larger portion of the material being raised again by a large wheel, with buckets on its circumference, to the rolls to be re-crushed. After being thus manipulated, and run into a pit, the material is treated in jigging machines, of which there are four, these being sieves worked up and down in water, by hand labour. The heavier portion, the lead, settles on the bottom, and the refuse, spar and stone, is easily removed from the top by practised hands. The material is further washed in flat buddles, and treated again in two other jigging machines with finer sieves. The fine portion of the lead ore is washed in round buddles. The ore is then ready for smelting. There are four smelting furnaces at Pontesbury in connection with the Oven Pipe Mine. The pig-lead produced is of the soft quality, and a very small amount of silver is combined with it, which is not extracted. The chimney for the smelting furnaces is 150 feet high. Previous to the erection of this chimney short stacks were used, the lead fumes from these proved so deleterious, and fatal to animal life in the neighbourhood, that they had to be abandoned, and the high chimney was erected, which has done away with this objection. VISITOR.

THE COPPER TRADE.

SIR,—In the letter published in the Supplement to last week's Journal I tried to show that there are not sufficient grounds for holding the present price of copper to be lower than supply and demand warrant. But though I do not believe in the theory of excessive depreciation, or see anything in the present position of the market to encourage speculators to go into the article, there is a sense in which I agree with "Investigator," that the trade is in an unsatisfactory state, while I dissent from the views expressed in his letter of last week as to the remedy to be applied.

The best possible condition of any trade is one in which consumption is carried to the highest point, while the producers of the raw material, the manufacturer, and the merchant earn fair profits. In copper we are a long way from this happy state. Although this point may be contested, I think we may infer from the high dividends paid till now by many mines, and the quantities of ore which continue to be worked, notwithstanding the low prices which have ruled for a considerable time, that the profits of the mining interest, if not large, are sufficient. By general consent, however, it must be taken that the other classes interested in copper have not for some years been making money, and this state of things appears to me to be due in great part to the operations of the class of "middle men" which "Investigator" wishes to bring again into the trade.

During the last 12 years the price of copper has been steadily declining under the operation of the natural laws of trade, but hardly one year of the 12 has passed over without a speculative effort to raise prices. The production of Chili was always going to fall off—drought had killed the mules which carried the ores to the coast, and reduced the miners to starvation; or the mines were flooded, or could not exist at such and such a price—the price of copper was lower than had been known for ever so many years, and low prices always bring round high prices. There was to be a European war, and war is good for copper, or there was to be no war, and all disquieting rumours being stilled business generally would revive, and copper would share in the improvement. These (not to mention the ridiculous episode of the war between Spain and Chili) were some of the arguments addressed to "middle men," and until recently with success. In consequence of their operations production has been stimulated, while consumption has been checked, and the net result to all concerned, except the miner, has been continued depression and loss.

These continued deceptions and losses have made such havoc amongst "middle men" that capitalists now fight extremely shy of copper; and, with all deference to "Investigator," the most ample statistics and the best possible system of warrants in Liverpool will not give them confidence. The suggestion that all foreign copper should be brought to market in the form of slabs, of 96 per cent., is not likely to command much attention, as in regard to most descriptions, except Chili, it is either not applicable, or would be a backward movement, and in any case it could only be very gradually acted upon. The bane of copper appears to me to be the extravagant attention paid to the Chili market. We go up and down spasmodically, according as the fortnightly telegrams advise light and heavy characters of copper produce. But the producing market is never the ultimate regulator of values. What the copper market wants above all is rest. If all those interested in the metal would dismiss Chili as much as possible from their minds, accept the existing large stocks as a fact not to be explained away, dissuade every-

one from buying copper as a pure speculation for a year or two, and concentrate their energies on the task of discovering new applications of the metal, inducing consumers, whose stocks we are told are light, to increase their purchases, and merchants to ship to new markets, where buyers are ready if copper were brought to them at a moderate price, we should find a great change in the condition of the trade, and might hope to see copper at its natural level, consumption keeping pace with production, without violent fluctuations in prices, and moderate profits all round. NOSIRIS.

March 2.

THE POSITION OF COPPER.

SIR,—I will not do "Nosiris" the injustice to suppose that he wished his letter to be considered as an answer to my remarks in your Journal of the 19th ult., for it will be observed that he does not even attempt to attack the keystone of my position—that whilst in 1862 seaport stocks were larger, and consumption smaller, prices were some 30 per cent. higher than they are to-day. Until these facts can be met or disproved I am unable to see how the present very low price of copper can be ascribed simply to excessive stocks.

The real object of "Nosiris" is, no doubt, to raise a useful discussion on some new issues, and on which I shall be glad to meet him. If, however, this discussion is to have any solid interest for your readers, let us keep as much as possible to well-authenticated facts, and to arguments based on such facts. "Nosiris" begins by demolishing the opinions formerly expressed by some eminent brokers as to the inability of half the Chili mines to work at such a price as 15*s.* for regulus laid down here. I do not wish in any way to support this theory, but I maintain that "Nosiris's" answer is likely to convey a wrong impression, unless accompanied by the statement that though the prices received in Chili throughout 1869 may not have averaged over 13*s.* 6*d.* here, this price was made quite 6*d.* per unit better (or equal to 14*s.*) to the Chili producer, from the fact of both freights and coals having been exceptionally low throughout 1869. I hold, therefore, that the effects of our present low prices have still to be felt on the West Coast, whilst the fact of the Chili charters, from July 1, 1869, to Jan. 17, 1870 (our latest date), having only been at the rate of 44,000 tons fine per annum, shows that the very heavy export in the first quarter of 1869 was exceptional, and that we are now returning to the moderate figures of 1867 and 1868.

I could here add that the last Australian quotations for copper likewise show a heavy loss on our present quotations, and that we have still to see the effects of these, also of our low price here at 72*l.* 10*s.*, less 3 per cent., for Wallaroo cake.

"Nosiris" next makes allusion to a certain Chilian mining company, but I find on enquiry that he is mistaken as to the price on which a saving is to be effected; and that so far from the new process being likely to increase the production of that mine, it will probably do the reverse—at least for some time; one of the arguments of the smelter referred to being that it is better to produce 2000 tons of copper at a good profit than 4000 tons with little or none. If, too, the prospects for this company were so brilliant as "Nosiris" would lead us to infer, why should the shares be still at such a very heavy discount? "Nosiris" next appears in the character of a prophet, and foretels an immense copper invasion from Colorado, but he omits to give us any precise date as to when these future supplies may be expected. Some years ago it was the fashion to write in the same way of California, where Chinese labourers can be obtained even more easily than in Colorado. No one says a word now about California, and I have before me the last Annual Trade Review of that State, in which the article copper is not even touched upon, whereas in 1864, 1865, and 1866 it occupied an important place in Californian trade reports.

As to pyrites, I can only say that the statement of the agent of one of the large Iberian companies leads me to conclude that the production of foreign pyrites is now at its maximum. But, as I cannot myself pretend to any special knowledge on this subject, I shall be very glad to hear the views of anyone who can speak authoritatively on the point, or who can supply us with information as to the pecuniary results of the present workings.

Now, one word as to our smelters "traditional policy." I never remember before to have had their actions placed before us from such an entirely philanthropic point of view, for I had hitherto been under the impression that, like other traders, their chief object was to keep the price of the manufactured article high, but that of raw material low, and thus increase their margin for profit. And I have always heard that they understood this art so well as to afford at the same time a reason and a reward for the making first of bars in Chili and then of manufactured copper in France. As to the necessity of present low prices to stimulate consumption, I find that persons thoroughly conversant with the copper trade in all its branches hold that consumption would not be in the least affected by a rise of 10*l.* per ton or more, whilst new outlets for copper (on the necessity of which "Nosiris" also insists) are being found in the great extension of marine telegraphy, breech-loading, small arms, &c.

I cannot conclude without observing that a perusal of "Nosiris's" letter by itself might lead to the inference that copper producers were now enjoying a sort of millenium. This must sound as a strange satire to those who are interested in the production of Australia, Chili, and Lake Superior.

It is singular, too, that "Nosiris" should never refer to the extension or suppression of copper production in California, Cuba, Russia, Italy, &c., and to the steadily declining yield in the United Kingdom, which should go far to compensate, if not entirely to extinguish, any increase elsewhere, and the permanency of which increase is, at least, a subject of grave doubt.

I trust, Sir, that the discussion which has been commenced in the Journal may prove the means of ascertaining the true position and prospects of this important metal. INVESTIGATOR.

NOTES FROM THE "NORTH"—BOILERS IN CORNWALL.

SIR,—Force of circumstances prevents many of your readers from perusing the Journal for days, weeks, and even months after date, the force referred to being the distance from "Fleet-street, E.C."—yet, whether the time is counted by days, weeks, or months, the pleasure and profit it affords when it *does* reach us "foreigners" is not marred greatly by the lapse of time. Evidence could be adduced from many lands to prove this assertion. India, Australia, the Cape, Chili, Brazil, Mexico, California, Canada, and other regions know it well; but there are northern lands, where we prize the *Mining Journal* as "household words"—the North, *par excellence*, where the aurora which Tennyson so striking alludes to in "Locksley Hall," when—

> "On her pallid cheek and forehead came a colour and a light,
> As I have seen the rosy red flushing in the northern night."

Yet, although we see nightly the "rosy red" whilst in proximity to the Arctic Circle, we are not quite lost to all sense of feeling, even when Reaumur indicates 20° to 25° of cold; but the feelings quite recently evoked have been warmed by an article in the Journal, occupying its leading column, dated London, Jan. 15, 1870, entitled "Boilers in Cornwall."

That the Cornish boiler is worthy of attention is an admitted fact from the article in question, and a word to friends from a friend who is an authority on the subject is entitled to due respect. But we beg leave to differ from our very best friends, unless their reasons or their homilies have a solid basis. The men of Cornwall are not flattered, let us hope, in being told that their pumps are models, or in being ahead in economy of fuel or smoke prevention, while an assertion goes forth that we are behind the age in the matter of boilers.

We are quite ready to acknowledge the genius of, and say let all due praise be given to, Messrs. Bolton and Watt. The writer remembers an engine by these gentlemen at work, and that machine was not famed for economy, showing that in the matter of the engine itself we have not retrograded. Most assuredly some of the Cornish engineers hath already replied to the article concerning "Boilers."

It is to their treatment we propose briefly alluding at present. But, first, for the men who are accused of "wilful neglect," and that there is too often neglect on the part of enginemen cannot be denied, but there are other parties who should also bear a considerable share of blame with them. Let their voice be heard in reply to a question—how often are boilers in Cornish mines run on month after month without cleansing, and feeding with foul water from the mine, bearing sedimentary deposits, and holding substances injurious to iron in solution, forming incrustations of various kinds and thicknesses on the fire-tube? Often acting as a complete separator and tolerably efficient non-conductor of heat at the very seat or fountain head of power. Whilst in the bottom of the boiler accumulations of sediment are not unfrequently found, thus blocking the space entirely between tube and case? To say nothing of the danger of working with foul boilers, what can be said of economy, or such wholesale waste of fuel under these conditions? Independent inspection of boilers has at least this much in favour of the movement—if there were inspection, the boilers would certainly be cleaned occasionally.

As a rule, men are insufficiently paid for the work of boiler cleaning, and there is often undue haste for getting the boiler "at work again" whilst in process of cleansing, instead of giving it a thorough and searching examination; and plausible reasons are given—that the necessities of the mine require it, so as to be free of water, or in "fork," on Monday morning. Therefore, we ask from friends and foes condemnation of the treatment, but not the principle of the Cornish boiler?

Let us now refer to the list of accidents in number, quoting from the Journal. No. 1 boiler, 37 ft. 6 in. long by 7 ft. outer diameter; tube, 4 ft. 4 in. diameter; at 40 lbs. pressure, collapse of tube from beyond the bridge to back end; shortness of water could not have been the cause of this accident, for the fusible plug remained unmelted, and the part of the boiler over the fire was left whole. No. 2 boiler, 32 ft. long by 6 ft. 6 in. diameter of outer case or shell; tube, 4 ft. diameter; at 40 lbs. pressure the tube collapsed, and the plug over the fire was uninjured; tube too large, &c. Space forbids our more than remarking that No. 5 collapsed beyond the bridge also. Respecting the frequent occurrence of collapse beyond the bridge, a few remarks seem called for, especially seeing that for one boiler which is blown away, as No. 6 was, there are at least 20 cases of collapse beyond the bridge: the cause of this demands attention.

First, the Cornish boiler is often set 1½ or 2 in. lowest at the firing end, designedly so to assist the flow of water and mud towards the tap-hole or drain-pipe, and this fall at the fire end is often increased from the extra weight of the furnace, fire-doors, &c., before the masonry is well set; it will, therefore, be readily understood that as evaporation goes on when the supply of feed-water is stopped from neglect or any other cause, the plates at the far end of the boiler become dry first, and, of course, first to get heated. But the fire being comparatively weak at such a distance from the furnace no immediate danger ensues, but slowly the water is being drawn away, and the plates become slightly red, until at length the back of the tube is dry back to the bridge, where the fire is strong, and the plates become of a bright red, until at length the point of endurance is reached, the iron being softened for a surface of from 20 to 30 square feet is incapable of resisting the pressure, which on a surface of (say) 25 ft., at 40 lbs. per inch, would reach about 64 tons on this weakened surface, hence the collapse. The fusible plug, be it remembered, from the fire end of the boiler being the lowest will be protected by water until the back of the tube is almost entirely dry. It has fallen to the writer's lot, in the ordinary course of his duties, to examine and deal with "burned" boilers, also cases of collapse, and could furnish details if time and space allowed, and shall be happy to add my mite to the elucidation of explosions if space can be afforded in the Journal, having worked in boilers and on them in Cornwall and other lands.

If Cornwall cannot, or will not, protect itself in the matter of boilers, call in the Midland inspectors; but I maintain that those having the boilers in charge are the best inspectors daily, and, let it be added, it is at night the inspector is wanted most; and a constant careful inspection of the feed-pump, safety-valve, and fire will pay better than any monthly inspection can possibly do.

The Cornish engineman's pay is not high; pay him a trifle extra to clean his boilers, and set up a simple float and whistle on every boiler, with the additional luxury of a blow-off cock. The expense is trifling as compared with the advantages accruing therefrom. In closing, it is with a hope that able dissertations on boilers and their treatment will find a place in your columns; and, if found there, it will most assuredly find its way, or should, at least, into every mine having a boiler at work.

A host of miners consider the *Mining Journal* a handbook, and it is natural that we, as a class, be interested in all questions relating to mines, British and foreign, having sympathies in common as to the prices of minerals and metals with the general correspondence from various mines, &c.—*Norway, Feb.* 15. A. R. R. O.

[For remainder of Original Correspondence, see this day's Journal.]

FOREIGN MINING AND METALLURGY.

Orders continue to flow freely into the hands of the coal-workers of the Nord, the Pas-de-Calais, and the Loire; it could not, indeed, be otherwise in presence of the excessive cold which has characterised the past month, and which has, of course, given a stimulus to domestic consumption. The deliveries by railway have been very active; those by navigations have been somewhat interrupted by frost. There is not much change to note in the French iron trade; the current of orders for iron in the Champagne district leaves, however, something to be desired as regards regularity. Refining pig has slightly improved; two contracts for mixed coke-made pig, good quality, have been concluded at 4*l.* per ton, taken at the works. Charcoal-made pig remains without much business, from the want of a disposeable stock; nevertheless, 4*l.* 12*s.* per ton is offered, and it would be difficult to obtain supplies on these terms. Iron is dealt in as follows in the Champagne district:—Coke-made, 8*l.* to 8*l.* 4*s.* per ton; mixed ditto, 8*l.* 12*s.* to 8*l.* 16*s.* per ton; puddled charcoal-made, first quality, 9*l.* 8*s.* per ton; ditto, second quality, 8*l.* 16*s.* per ton. Machine-iron and iron-wire have maintained a good tone, and prices have been very firmly supported. At the last meeting of the Committee of Champagne Forgemasters, held at St. Dizier, various communications relating to metallurgy were made to the committee by the secretary. Attention was directed to the use of wolfram for the improvement of iron and steel, as well as to a decree of the Court of Dijon with reference to the responsibility of industrials in cases of accidents arising from an external cause, or from defective surveillance. The committeee appointed a sub-committee to consider different projects for the establishment of railways and canals in the Haute-Marne. The committee determined to meet monthly, and to hold also extraordinary meetings whenever circumstances may render them necessary. The Moselle forges are stated to have made an advance of 4*s.* per ton on the Swiss market; this would carry the price of iron to 8*l.* 8*s.* per ton, free at Bâle. The Jarville forges, near Nancy, are to be shortly offered for sale. MM. Dupont and Dreyfus have three furnaces lighted at St. Paul and St. Benoit; another furnace is now in course of construction at St. Benoit. MM. Dupont and Dreyfus have 32 forges lighted, and they have established an iron warehouse on the banks of the canal lateral to the Garonne. A single furnace is lighted at Frouard, and two have been demolished; a new furnace is, however, in course of construction. The Pont-à-Mousson Works are producing pipes on a large scale; these works now comprise four iron-furnaces, two for refining and two for casting pig. The forge of MM. Karcher and Westermann may be stated to be at present in full operation; the firm has also 14 puddling-furnaces lighted. Refining pig, which has so long been in a depressed state in the Comté district, has been held with much more firmness since the issue of the Imperial decree of Jan. 9, 1870, with reference to warrants; the price of this description of pig has returned to 6*l.* per ton, after having fallen to 5*l.* 8*s.* and 5*l.* 12*s.* per ton. Nevertheless, the producers of the Comté group maintain a prudent attitude, and are not at present at all exacting. In December, 1869, 2506 tons of iron and 1896 tons of pig and castings entered Paris, against 4404 tons of iron and 2012 tons of pig in the corresponding month of 1868. The imports of pig into France last year compared as follows with the corresponding

Imports in 1868:—	1869.	1868.
Imported free of duty ..... Tons	130,230	98,571
,, for shipbuilding	3,748	1,471
,, with payment of duty	3,136	16,976
Total	137,114	117,018

As regards iron and plates, the totals stand thus:—

	1869.	1868.
Imported free of duty ..... Tons	62,653	51,232
,, for shipbuilding	10,378	10,378
,, with payment of duty	3,198	4,562
Total	76,229	66,172

The total exports from France by warrants of castings, pig, iron, plates, &c., amounted in 1869 to 197,009 tons, against 158,113 tons in 1868, while the direct exports were 25,427 tons, against 26,445 tons in 1868.

The Belgian iron trade remains in a satisfactory state. Orders arrive in an encouraging fashion, and some French buyers have even appeared. The production of plates, merchants' iron, and pig is very active; some rather considerable contracts for pig have been concluded for the rolling mills of the Charleroi and Centre basins. Refining pig is quoted at 3*l.* to 3*l.* 12*s.* per ton; merchants' iron is dealt in, according to the importance of contracts, at 6*l.* 18*s.* to 7*l.* 6*s.* per ton. A statement that the Rossignol furnace, near Walcourt, was about to be re-lighted appears to have been premature; it is proposed to sell the property to some foreign industrials, and should negociations now in progress be successfully carried through the works will probably be considerably extended, and numerous coke furnaces will be built. The Belgian coal trade continues prosperous; orders have flowed in from all parts, and domestic qualities have been especially in demand. As regards coke, the demand considerably exceeds the production; the great difficulty and source of annoyance both to coal owners and coke producers continues to be the unsatisfactory state of the transport question.

Further searches for coal are being made in Prussia, and the coal mining and siderurgical industries of the Ruhr district continue to display much activity. The demand for coal and coke has not slackened, even since the closing of navigation on the Rhine.

The French concern known as the Compagnie des Chantiers et Ateliers de l'Océan has just held its annual meeting, under the presidency of M. de Germiny. The report presented by M. de Germiny on the operations of 1869 showed that the results of last year were less unfavourable than those of 1868; nevertheless, the working of 1869 was attended with a slight deficit, in consequence of a deduction made to redeem a portion of previous losses. The sum represented by the orders which the company has now on hand is nearly 480,000*l.*, and better results are accordingly expected to be achieved in 1870. As the company has not a sufficient amount of floating capital to carry out these orders, it has been determined to open a credit with the bankers to the extent of 120,000*l.* The revenue of the Parisian Company for Lighting and Heating by Gas showed an increase in January of 7·68 per cent., as compared with January, 1869.

Copper has been feeble at Havre; Chilian in bars has made 68*l.* to 68*l.* 8*s.* per ton, Paris conditions. At Paris the article has been stationary, but the tendency has been towards feebleness. There has been little change in copper at Marseilles or on the Dutch markets. An improvement noted recently in tin at Paris has been maintained; Banca has made 124*l.*; Straits, 122*l.*; and English to be delivered at Havre or Rouen, 120*l.* The Dutch tin markets have displayed a favourable tendency. At Rotterdam, although affairs have remained without much importance, prices have ruled high; about 68½ fls. has been paid for disposeable Banca, and for the present there are no sellers below 69 fls. Billiton is very scarce; some transactions have taken place at prices a little below those current for Banca. The last mail from the Dutch Indies announces very considerable deliveries for Holland. The stock which the Society of Commerce has available for the approaching sale now amounts to about 80,000 ingots. There is no material change to report in lead or zinc.

FOREIGN MINES.

ST. JOHN DEL REY.—The directors have received, per the Amazon, the following report, dated Morro Velho, Jan. 29:—Morro Velho produce, second division of January, 12 days, 2951 oits.; yield, 1·790 oits. per ton. Gaia produce, second division of January, 12 days, 203 oits.; yield, 1·187 oits. per ton. The sinking in the new shafts, &c., during January has been as follows:—A, sunk 3 fms. 3 ft. 2 in.; B, sunk 1 fms. 3 ft.; and the brattice extended 98 feet. The adit has been completed through into B shaft. The hauling in these shafts has been of late tedious and ineffective, but this will be very shortly remedied.

DON PEDRO.—Produce weighed to date, 9193 oits.; estimate for month, 11,000 oits. The line in No. 6, ascending, has been very fluctuating—not so good as in the beginning part of the month; to date the line is defined, but poor. The stopes in canoa, underlie lode, have yielded good general and a little average box-work. No lode has been excavated from the stopes in the curve; those west of gully are turning out a large quantity of ore. The horse-engine went to work on the 24th, and is doing capital duty. We shall push on as quickly as possible the sinking of Vivian's shaft. The lode cut in Alice's west is opening out most satisfactorily; eight boxes of work (about ½ ton) were taken from it on the 28th, which gave 70 oits. of gold; the general body gives fair strake work. It is about 40 fathoms west, in Alice's, from where the main shoot ceased to be auriferous, so in all probability it is entirely a new thing, and not in any way connected with our main shoot of lode.

ANGLO-BRAZILIAN.—Little or no change to note since my last. Dawson's improving in appearance, and less killas intermixed with the stone. The other sections promising.

ROSSA GRANDE.—General operations have been carried on with regularity, and satisfactory duty has been performed. Since my last little change is to be noted in the appearance of the lode at Mina de Serca. The lode recently intersected by the shaft is opening out very encouragingly; its size is from 4 to 5 feet wide, and its quality equal to that below the 56, and averages from 11 to 12 oits. per ton.

GENERAL BRAZILIAN.—The buildings have advanced apace. The houses for party expected are nearly finished, and a large store commenced. Several houses have been purchased. At St. Anna and Itabira the shallow adits are in progress; a map representing them will accompany the monthly report.

ANGLO-ARGENTINE.—Advices have been received from Mr. Barnard, detailing the various preliminary mining operations at present in progress. The number of peons continues to increase, and the best character of labour in the province is now obtained. The surface works are progressing satisfactorily. The road is finished, effecting a great saving of time, distance, and animal power. The peace of the province has been undisturbed throughout the past six months.

UNITED MEXICAN.—Extracts of despatch from the Commissioner, dated Guanaxuato, Jan. 24: Mine of Jesus Maria y Jose: We have continued work much as usual, except that workmen on hacienda account have been withdrawn from the deepest workings, and placed on our reserves above. By these means I hope to raise the leys, and give less unfavourable accounts than those of the last quarter of 1869, in which the loss on the mine amounted to $10,021. The sales since Jan. 1 have been—On the 6th, $1638; on the 13th, $1609; and on the 20th, $1585.—Mine of Remedios: The workings in Remedios are much in *statu quo*. The mouth of the mine is distant from the highest frente (San Cristobal) only about 14 varas, and has been stopped. In the meantime we shall open a contracielo (working upwards) in San Cristobal, to drive towards the mouth, whilst we are getting doors and gratings ready to secure the latter. The workings are yielding us a good deal of ore, and are leaving profits. The sales since the commencement of the new year have been—On Jan. 6, $905; on the 13th, $888; and on the 20th, $905.—New Concern: Adit of San Cayetano: The rock in the adit is favourable for anvancing, but the work is getting very hot and close, and we have to slack off occasionally to let it cool. Many "relices" have been passed, and we seem to be very near the main lode, but the rock, both in the adit and in the Buenos Ayres shaft, seems to be much shaken up by some convulsion of nature. There is no rule for saying whether this feature is favourable or not to our speculation, as in ground similar to that we are in I have met with both barren and productive veins, but we are getting gradually nearer the shaft, and when we have communicated with it we can proceed with works of exploration.—Mine of Buenos Ayres: The shaft on Jan. 22 was 131 metres deep, and we are in a vein composed of strips of quartz and carbonate of lime, between layers of steatite, thus far without silver. I am in doubt whether we are in the main lode or in the ramification which sometimes rests upon it; the latter seems to be more probable, from the fact of our having no water yet, but against it I must state that we are in the exact place in which the vein ought to be found.—Mine of San Antonio de la Ovejera: In the shaft the rock is extremely hard, and on January 22 we reached 158¼ metres depth. During the month we have cut two strips of quartz, one with a line of antimonial sulphuret of silver running through it; it is of no value, except as an indication of the argentiferous nature of the country.

IMPERIAL SILVER QUARRIES.—Bullions, Feb. 5: I have to inform you that work at the mines is now stopped. The tunnel is now in 1406 feet.

EXCHEQUER.—Silver Mountain, Feb. 5: I have the pleasure to inform you that things look well at the mines. I have sent for, and to-night expect to have here, sacks to load with ore for the English mill at Reno. More I need not say at present.

BAYANO ESTATE COMPANY (Limited).—The manager at Panama writes, under date of Jan. 3, the following to the board of directors:—"According to the last advices from New York the ship canal, which is to connect the Atlantic and Pacific by means of this Isthmus, has now been definitively determined upon. The surveying expedition has already been organised, and the routes, which will be thoroughly examined by it, are the San Blas and Chepo (Bayano) route, the Caledonia Bay and San Miguel route, and the Altrito route. Should the Chepo (Bayano) route be selected, our property will adjoin the projected canal, and even if any of the others are inclusive to Chargres Panama, we shall be at such a short distance from the Pacific terminus of the canal that we can reach it within a few hours. With a quantity of valuable timber for building purposes, with the best kind of fuel close to the edge of the rivers, and all our products easily carried to market by the Bayano admitting of the entry of steamers of several hundred tons, our estate will be soon very valuable. You are aware that the steamers Flamingo, Panama, and Morro have visited our estate, and I have now been advised that the steamer Montijo, which is still larger, will soon pay us a visit. Also allow me again to direct your attention to the advantages that would accrue from part of our extension, Hatto Bayano, being turned into a cattle estate; and it seems to me to be more than ever our interest to extend the cultivation of sugar and other products. December having been very wet, we shall not begin to grind our cane before Jan. 15. The whole of the last crop has been sold, except about 800 gallons of molasses, and about 1000 lbs. of sugar."—[The fully paid-up shares of the Bayano Estate Company (Limited), to which all shareholders in the Central American Association (Limited) are entitled, are now ready for delivery, and may be obtained on application to the secretary.]

CAPULA.—Capt. Paull, Jan. 26: Pachuca: In my last, of the 7th inst., I mentioned that a party of pronunciados had come to Capula. On the th inst. the Government sent forces there to attack them; there was a great deal of firing without doing much injury on either side; the pronunciados retreated. The Government troops, after sacking all the houses, returned here. The miners, with their families, fled to the mountains, and were afraid to return for some days. The pronunciados returned the same evening to Capula, and sent a message to say they would not do any injury to the company's works, but we must assist them with arms, &c. On Sunday last the Government sent another force there, but the other party had left, and all the inhabitants, or nearly so, had returned again to the mountains, so we had no one to work on Monday; such is the state of affairs at present. The torta in San Diego hacienda is in beneficio (150 cargas), and the one in Jesus hacienda will be incorporated to-morrow. The other torta in Jesus is ground, but not incorporated. The assays will be made to-morrow at La Purisima. Nothing has been done with the polvillos in San Cayetano. We sent in one turn of metal to mix with the polvillos. The owners sent word not to send any more. I have sent 120 arrobas of salt, but if they will not reduce the polvillos we shall have to take it away, also the quicksilver, over 1300 lbs. We have about 200 cargas of good quality ore at the mine, ready for transmission, but cannot get any carriers. Everyone is afraid to risk their animals on the road. The company's mules are here; I was glad to get them away from Capula. The pronunciados embargoed them once, but fortunately we did not lose a mule; they took a horse, but returned it in about

12 days. If the revolution continues, which I am afraid it will for some time, I consider it would be better to sell the mules, and trust to the carriers.—The Mine: The ground in San Pablo cross-cut still continues very hard, but I am glad to say it is letting out much more water, which makes us consider we are getting very near San Ignacio lode, and when intersected will, no doubt, drain the winze below the adit level, whereby we shall be able to increase the extraction considerably. The lode in the Esperanza end is without much alteration since my last; the ground is rather harder. San Enrique winze and cross-cut south from it are suspended on account of the water: we have put the men to drive the San Enrique end east. The stopes to the west of San Jorge rise have improved, but to the east the ore has fallen off, and the ground very hard. On Saturday we only parted 209 costales, but 56 were of the best class ore. The men did not work regularly, on account of the revolution, and a great deal of dressing work remained on the mine.

CAPE COPPER.—Capt. J. Williams, Ookiep, Jan. 4: I am sorry to say nothing has been done in the engine-shaft during the past month, owing to the men being very unwell, but I am glad to say they are now able to resume working again; and we have re-set the shaft to sink below the 40 fathom level to three men and six labourers, at 45*l.* per fathom, for 2 fms. or the month. No. 6 winze during the past month has been sunk below the 40 fm. level 2 fms. 3 ft. in a good course of copper ore; it will now yield about 9 tons per fathom; we have about 3 fms. more to sink to be deep enough for the 50 fm. level, which we hope to do by the end of this month, if not prevented by having too much water to contend with; re-set (Jan. 3) to three men and nine labourers, at 35*l.* per fathom for the month. The 40, west from the engine-shaft, has been extended during the past month 1 fm. 3 ft. in a good course of copper ore; at present it will yield about 4 tons per fathom, and very promising to improve; re-set (Jan. 3) to two men and two labourers, at 22*l.* per fathom, for 2 fms. or the month. The 40, south from No. 4 winze, has been extended during the past month 4 fms. in a very fine course of copper ore; it will now yield from 8 to 10 tons per fathom. We have about 8 fms. more to drive to communicate to the winze sinking below the 30 fm. level, which is now 9 fms. 1 ft. deep, in a very good course of copper ore: re-set (Jan. 3) to three men and three labourers, at 10*l.* per fathom, for 5 fms. or the month. No. 5 winze, below the 30, has been sunk 2 fms. 2 ft. 6 in. during the past month in a splendid course of copper ore, and will now yield from 8 to 9 tons per fathom. We have about 8 ft. more to sink to reach the 40, when we shall drive towards the end being driven south from No. 4 winze; re-set (Jan. 3) to three men and six labourers, at 25*l.* per fathom or the month. The 30, east from the flookan course, has been extended during the past month 1 fathom, through ground producing a little ore, but not sufficient to value; at present it is a very kindly end; re-set (Jan. 3) to one man and one labourer, at 13*l.* per fathom, for 2 fms. or the month. The rise in the back of the 20, on Job's branch, during the past month has been extended 1 ft. 10 in., without any change to notice; re-set (Jan. 3) to one man and one labourer, at 20*l.* per fathom, for 1 fathom or the month. The winze and stope in bottom of the 20, west from the engine-shaft, are looking very well, and will yield about 8 tons of copper ore per fathom: re-set (Jan. 3) to one man and five labourers, at 8*l.* per cubic fathom, for 5 fms. or the month. The stope in the bottom of the 20, from No. 3 winze, is much the same as when last reported, yielding about 8 tons of copper ore per fathom. We have re-set the 20, south-west from the incline, to one man and one labourer, at 20*l.* per fathom, for one fathom or the month; this end will yield about 2 tons of copper ore per fathom, and promising to improve. I am pleased to remark that I have never seen the mines looking so well as they are at present, and so likely to continue. Our sampling for the last month was not so good as it would have been, owing to the breakage of the crank of the whim or drawing machine, which caused a delay in hauling for about a week. December extract, 490 tons of 21 cwts., or 514 tons 1008 lbs. of 2240 lbs.; average per cent., 29⅝.—Spectakel: The 27 east, on the north mineral course, has been extended during the past month 2 fms. 3 ft. 6 in., through good ground that has yielded from 2½ to 3 tons of very rich copper ore per fathom, at present not quite so good; this end is very near the flookan course, where we may expect an improvement. The 27 east, on the south part of the north mineral course, has been extended during the past month 2 fms. 7 in., also through good ore ground, that has yielded from 2½ to 3 tons of rich copper ore per fathom; at present it is not looking so well; this end is also approaching very near the flookan course, and more in a direct line to meet the end being driven west from Kelly's shaft; at this point the north mineral course appears to be divided into several branches, and I have no doubt we shall meet with similar results to the east of the flookan course; to prove this we shall have to open a level north and south on the flookan course when cut, and drive east on the most productive branches we may meet with; and should these ideas prove correct, there is very little doubt but that we shall find some good runs of copper ore standing to the north of Kelly's and Landsberg's shafts. The winze sinking under the 15, an the flookan course, is now 8 fms. 5 ft. 2 in. below; we have carried a part of the north mineral course in the winze, which has yielded from 1½ to 2 tons of very rich copper ore per fathom; at present it is looking very promising, and yielding good saving work. The 27, west from Kelly's shaft, has been extended during the past month 1 fm. 1 ft. 4 in., through good ore ground that will pay for stoping; when this end is communicated to the 27, which will take from three to four months more to accomplish, it will greatly facilitate the working of this part of the mine. Landsberg's shaft during the past month has been sunk 1 fm. 2 ft. 1 in. in good ore ground that will also pay well for stoping when properly opened; at the present time it is looking well, and improving every sink we make, and judging from its appearance, there is very little doubt but that we shall have good runs of ore in depth in this part of the mine both east and west of the shaft. We have two stopes working in the back of the 27, that will yield on an average about 3 tons of copper ore per fathom; and one in the bottom of the 27, between 8 and 9 fms. below where we are sinking and stoping that will yield from 5 to 6 tons of copper ore per fathom, which is improving in depth every sink we make. I have much pleasure in being able to say I have never seen the mine looking better. I have no doubt but that it will be a good and profitable one for very many years to come. I am also glad to say that the surface operations are being carried on very satisfactorily, and we hope to be in full course of working by the end of the month. The estimated extract for December is about 144 tons, of 40 per cent.

NEW WILDBERG.—J. Sanders, Feb. 25: East Mine: The lode in the driving east at the Erbstollen remains as last week, worth ½ ton of ore per lachter.—Carter's Shaft: There is no change to notice at the 70 lachter level, on Erbtiefstergang Erzkammer; the driving and stopes continue to yield 1¼ ton of ore per cubic lachter. The rise and stope above the 60 lachter level, towards Johanne's sink, continue to yield 1 ton of ore per cubic lachter. The stopes above the 50 lachter level, on Dornergang Erzkammer, are yielding on an average 1 ton of ore per cubic lachter.—Beck's Workings: The stopes in this part of the mine are yielding 1¼ ton of ore per fathom.—Blumengang: The stope above the 70 is yielding 2 tons, the middle level, between the 70 and 60 lachter levels, is yielding 1¼ ton, and the stope above the 60 1¼ ton of ore per lachter.—West Blumengang: The water was pumped out of the first sink last night.

WORTHING.—T. Prisk, Adelaide, Jan. 4: In my report for the past month I have nothing new to write about. The ground in the engine shaft continues favourable for sinking; ground sunk in the month is 8 ft. 10 in. The 93 end north is about the same as last reported; ground driven in the end for the month is 16 feet 8 inches: present price for driving 14*l.* per fathom. The 93 caunter is poor and small; this end I have stopped for the time. The 93 cross-cut east continues to be driven; the ground is a little harder than last reported; driven in the past month 26 ft. 10 in., present price for driving 8*l.* per fathom. The 83 north end is discontinued for the time, as the lode is small, and very wet, and the air is dead, which makes it very expensive for driving. We have holed the rise and winze from the 83 north to the 63 fm. level, so that we have now a good block of ore ground cut out for stoping, and the air very much improved. In the 63 fm. level we have commenced a rise to try if we can get out at the 53, and make off the lode at that level; in the mean time we shall be cutting out stopes and ventilating the mine. The lode in the end in this level (63 north) has improved since my last, and should it continue will open up good paying stopes; ground driven during the month is about 3 fms.; present price for driving 11*l.* 10s. per fathom. The stopes about the mine are much as usual. The quantity of ore raised and dressed is 210 tons, a little improved in quality. The number of hands employed on the mine is 138.

[For remainder of Foreign Mines see to-day's Journal.]

MINERAL WEALTH OF VICTORIA.—The following is a return of the mineral yields of Victoria, from the first discovery of the Gold Fields in 1851 to the end of the year 1868:—

GOLD—Quantity exported from the date of the first discovery to Dec. 31, 1868, 36,835,691¾ ozs., at 4*l.* per oz.		£147,342,767
SILVER—Ore raised, 11,348 tons; produce of silver from ore treated, 18,353 ozs., 8 dwts., at 5s. 6d. per oz.		5,047
TIN—Ore exported, 2601 tons 2 cwts.	£192,936	
,, 92 tons 9 cwts., at 70*l.* per ton	6,471	
,, 177¼ tons, at 52*l.* 10s. per ton	9,318	
Tin exported, (say) 3 tons 12 cwts. 3 qrs. 12 lbs., at 140*l.* per ton	510	
7 tons 16 cwts.	729	209,964
COPPER—Ores raised, about 855 tons.		
Smelted, 31 tons 7 cwts., at 112*l.* per ton	3,511	
Regulus, 70 tons 16 cwts.	1,969	
Rough copper, 10½ tons	320	5,800
ANTIMONY—Ore raised, 2955 tons 15 cwts. 0 qr. 26 lbs.	32,102	
,, 435 tons, at 6*l.* per ton	2,610	
,, 272 tons, at 9*l.* per ton	2,448	37,160
COAL—1933 tons, at 1*l.* 10s. per ton		2,899
LIGNITE—235 tons, at 17s. 6d. per ton		205
KAOLIN—1757 tons, at 4*l.* per ton		7,028
FLAGGING—57,500 square yards, 19,425*l.*; 1200 tons, 2,100*l.*		21,525
SLATES—1000, at 8*l.* per 1000*l.*, 8*l.*; 160 tons, at 4*l.* per ton, 640*l.*		648
MAGNESITE—6¼ tons, at 2*l.* per ton		12
DIAMONDS—About 81 carats		81
SAPPHIRES—The numbers cannot be estimated (say)		150
Gross produce		£147,633,286

MANUFACTURE OF IRON AND STEEL.—Mr. R. MALLET, of Victoria-street, Westminster, proposes to employ pyrolusite or deutoxide of manganese, ground to a fine powder, and strongly compressed, to improve the quality of iron and steel when the crude metal is treated with nitrates, chlorates, &c.

AERO-HYDRAULIC ENGINE.—An improved engine has been invented by Mr. V. COIGNE, of Paris, which consists of two circular basins united at the base and by an iron tie-piece. These basins are open at the upper part, in the shape of a truncated cone, and to these cones are fitted two cylinders (one to each basin). Within each basin is a hollow cylinder, in which is placed a pipe of square section, having at each of its ends vessels made of vulcanised cloth, and of a parallelo-pipedon form. Two of the cloth vessels are fixed at the lower part, outside the apparatus, and to these are attached the connecting-rods intended to turn the double-cranked driving-shaft. In the middle of the pipes with square section is a slide-bar, leaving the orifice free in the second basin while closed in the first. This is effected by means of a horizontal shifting movement given to a triangle provided with a handle, to which the cylinder-rods are attached.

The Royal School of Mines, Jermyn Street.

MR. WARINGTON SMYTH'S LECTURES.

[FROM NOTES BY OUR OWN REPORTER.]

LECTURE XXVIII.—With regard to mining masonry (said Mr. SMYTH) there are some points to be reviewed, both as to what is suitable to apply to horizontal excavations and to those of a vertical character—namely, the shafts. In most of our mining districts, unless the workings themselves yield a peculiarly suitable stone, and applicable to the purpose, timber is preferred, because of its superior cheapness, and the facility with which it can be cut into proper forms; but there are cases in which masonry has decided advantages, independently of its lasting for a greater length of time. For instance, in some southern countries the timber becomes after a year or two so excessively dry that the danger from fire is very great. Formerly very little was thought of such a peril, but of late years events have occurred which have shown what terrible results may be expected when fire establishes itself amongst the timber of the levels and of the workings. In the cases I have referred to, fire which had been smouldering, say, for days broke into flame, and then ran along the levels with surprising rapidity, and all the supports being thus suddenly withdrawn the roof came down in innumerable places, and effectually cut off for a very long period all communication. Similar catastrophes have more frequently occurred in the shafts where wooden brattices have been dried by the hot air conveyed through the upcast, until they have become as inflammable as so many matches. With regard to mining masonry (stilling, or steining, or walling, as it is variously called), the usual material employed is stone. There are districts, however, in which the clay forms an admirable substitute, and bricks are made and shaped with special reference to the position they are to occupy. In some mines stone enough is got in the process of working, and in others regular quarries are opened underground, although more frequently at the surface. Of the stones which thus come into play the most frequent are those varieties of sandstone and grit which have sufficient stiffness and adhesiveness of character. The coal measures furnish these in large quantities, and the beds are mostly of a convenient thickness, and are quarried in proper lengths: squaring and dressing, except of the most superficial kind, being unnecessary, masonry is put in at a very cheap rate. In many of the workings of Yorkshire, in Lancashire in a less degree, in North and South Wales, and in the Forest of Dean excellent stone work is to be found, both in shafts and levels, but in the latter more especially. Stone work is also carried out to a great extent in the lead mines of the North of England. Another material capable of being employed on a large scale is gneiss, or stratified granite, which makes capital slabs. Other rocks are also utilised on the Continent, particularly those of a schistose character, whether micaceous or hornblendic, and clay-slate. Some of these, however, are found to split to pieces readily, and must not, therefore, be used in long lengths to resist pressure; but where they contain a large proportion of quartz, and where their physical character is not such as will incline them to split, stone of this character will be found very useful. Limestones also come into play in some districts, but they require an amount of labour to square and to shape which costs too much. When, however, it is got in thin beds, as in the Lias formation, it is very valuable for underground walling. Hard granite is seldom employed, except for special purposes; and in the Tresavean Mine there is some splendid arching of granite obtained from the country. Some of the greenstones and porphyritic granites are useable when the joints and planes of lamination run through them in a suitable direction. In North Staffordshire and other districts, where stone cannot be obtained, Nature supplies a substitute, as I have said, in the clay beds, which usually make admirable bricks, and are worked with facility and economy.

The simplest methods of protecting levels by means of steining will be found where the material is met with in largish slabs, as in Derbyshire, where in some of the old lead mines a little hitch is cut on either side for the ends of the slab to rest. In Spain it is extremely common in the older mines to find this system carried out with two slabs, which are made to rest against each other, and form something like a pointed arch. Very frequently smaller pieces are used, put in roughly but closely, so as to form a flat roof. The forms of arches are exceedingly varied, that being a point depending upon the nature of the pressure. The barrel shape is one of the cheapest, and one of the most common; the simple semicircle and the horseshoe forms are also much used in some districts. Great consideration is necessary in deciding upon the shape and character of the arch, that being the best which is best qualified to resist the particular thrust to be provided against. Under all circumstances, and with all forms, it is necessary that the space over the arch should be closely packed with pieces of stone, so as to equalise the pressure from above, when it gradually settles upon the arch. A great deal of this kind of arching and walling is done with dry material, but in some cases mortar is as necessary in setting the stone as in setting bricks. In these cases it is a great point to obtain mortar of a high hydraulic character. Sir Charles Pasley's book on the subject of mortars and cements says that a great many kinds of material could be used as hydraulic lime. In the older works on the subject, and in past times, much stress was laid upon the introduction of material brought from certain volcanic districts; and tufa and trass, a conglomerate in which felspar plays a great part, were included in all the old compositions for setting bricks under water. While, however, they were fetching these substances from Naples and Sicily, at great expense, abundance of much better material for the purpose existed in the upper portions of the mountain limestone, stretching from Lyme Regis to Redcar, on the coast of Yorkshire. When, therefore, in the mountain limestone a series of beds of a dark colour, and having in their composition about 25 per cent of other substances besides carbonate of lime, it will be wise to try experiments as to its character, by drying, grinding, and then placing it under water, to see if it will set and solidify as readily as other hydraulic lime would do. If the trial be satisfactory the mining engineer has at hand a most valuable material for any kind of walling he might require.

[The lecturer here, by means of drawings on the board and models, exhibited a great variety of arching and of walling, pointing out the special advantages of each.]

Objections are sometimes made to walling on the score of expense, and no doubt when the excavations are large that is a serious consideration. If, however, we look at a few of the circumstances in which it is necessary to employ mining masonry, in a smaller or a greater degree, we shall find that the outlay it requires is far from being uneconomical. Take, for instance, an adit level. Its maintenance is absolutely indispensable, and as long as the mine lasts it must be kept up. If it be secured with timber, the condition of the wood must be carefully and continually inspected, and repairs and replacements of decayed beams, leg-pieces, head-plates, and the like, will be incessant. On the other hand, a properly constructed walling will require but little inspection and repair. Neither is the first expense always, and of necessity, great, as in the North of England the miners themselves put in excellent workmanship, at so much per fathom or per yard. Admirable examples of brick walling of this nature are furnished by the Metropolitan Railway, where great and weighty masses have to be kept back in this way. Whole houses and streets have to be supported, and the most terrible results might follow if a wall succumbed to the pressure from above; but the work is excellent, and carries with it a great appearance of strength and security. It is done gradually, putting in the brickwork in small pieces at a time, while the ground is supported by timber. In these cases the great element of safety is to be found in properly placing sufficient buttresses, which lay hold, as it were, of the ground; and, wherever necessary, arching the wall against the side pressure from without, as you will see done for considerable distances at a stretch on the lines of railways where they pass through towns.

There is another point to be noticed in the arching of underground drifts, galleries, or tunnels, when, as in some cases it is necessary, it is wished to push forward the extremity, or end, and at the same time secure the ground permanently by means of masonry. The larger the scale of the work the more difficulty there is. I have already mentioned the difficulties arising from keeping too large an area open at once, and instanced the case of Mr. Trevithick, who carried a small drift under the Thames, when the larger tunnel broke down continually, and was only carried at the last by a system of pushing forward the face divided and subdivided into a number of small cells, a contrivance which was, indeed, the masterpiece of the elder Brunel's career. In this way so many inches were won in such a time, and the tunnel slowly but surely was carried through to completion. This is a principle which must never be lost sight of in difficult ground. I do not know that I was ever more impressed with a work of this kind than by what I saw on a recent visit to the great tunnel now being driven under Mont Cenis. It is carried, as you know, under a lofty mountain, through which there is no possibility of sinking a shaft. In times gone by such a work would have lasted 30 or 40 years, but by the introduction of an admirable system and ingenious machinery we are likely to see it completed in less than three years. At the end of an ordinary tunnel only two or three men can work at once, but in this great work 500 are employed. The tunnel is from 15 to 18 ft. high within the masonry, which is 2 ft. thick, and 25 ft. in width. The works are carried on by subdividing them, both as to height and width. At the further end the opening is just like a mining drift, 10 ft. square, and is worked by one set of men; then a second set follow, and enlarge it to 20 ft.; and then a third set, who make it the full size for the masons, who put in the lining. It is only by this division of the work that it has advanced with such extraordinary rapidity. The scene to the visitor is very remarkable. First comes the masons at work, then an interval of darkness, then the next set of workmen; another space of utter darkness, and another set of men at work, with blazing torches; and so on, until at last the face of the working, where the borers are at work is reached. The whole principle of the operation is to open first at a small size for security, and then to enlarge it by successive sets of men to greater widths. In this way the men work under conditions of absolute security, and a large number are brought to bear at once.

LECTURE XXIX.—Our subject to-day (said Mr. SMYTH) will be the means of protecting the shafts against accidents by the use of timber, and more especially the shafts of metalliferous mines. You will recollect that with respect to form these are usually rectangular, while those of collieries are circular or elliptical. But there is another point of difference to be noticed between the shafts of metalliferous mines and those of collieries. The latter have large quantities of material to be conveyed through them, and have to stand open for years, as the great thoroughfare also through which the men have to pass in going to and returning from their work. It is, therefore, important, and indeed indispensable, that they should be lined from top to bottom with durable material, not so much to guard against a total collapse, as to prevent portions of the sides from breaking away, and endangering the lives of those travelling through them or working in them. In metalliferous mines the case is far different. In the first place no single shaft has anything like the traffic through it; as in a large mine the work will be going on in half a dozen different levels, and the material won will be passed to the surface—one portion up this shaft, and another portion up a second, and so on. There is, therefore, only a small amount of work at each, and a small amount of risk to be run by the men for want of a complete lining to the shafts, which would, therefore, be not only a vast but an unnecessary expense. In metalliferous mines it is usual to find a certain portion of the shaft lined or secured, sometimes closely, and at others partially, while the remainder may not be secured at all. Considerable distances, therefore, exist in which the only timber is the staging for the ladders. The shafts, too, are of extremely different dimensions, and strong timbering is used in the one case, which in the other is dispensed with. There will be also differences according as the shafts are more or less vertical or inclined. If they are inclined at a considerable angle they acquire something of the character of a drift opened on inclined strata, and of late years several mines of importance have been opened in that way. In metalliferous mines it sometimes happens that the shafts commence in a vertical direction, and the inclination of the vein or the nature of the ground makes it advisable to leave the perpendicular line, and continue the shaft in an inclined direction; but, as I have mentioned, it is sometimes thought best to make the shaft an incline from the surface. There are some in which the latter plan is the only one possible; as, for instance, a mine in which the workings go out right under the sea after the shoots of ore which have taken that direction. The ground on the shore will naturally be much saturated by moisture, and it will probably be found the best plan to sink the shaft obliquely, and so bring up the material by an inclined plane, instead of having to encounter two or three angles. Such a shaft would be secured like a drift, and in a manner differing considerably from the rectangular shafts common in metalliferous mines. In almost all cases, however, there will be at the surface of the ground a larger or smaller amount of alluvial material, such as mud, gravel, loose stones, and the like before the solid rock is arrived at. The amount and strength of the timber to be put in will depend upon the nature of the case, whether the debris is harder or softer, or more or less permeated by water. The first thing is to make the sides of the opening safe. Thus in sinking trial shafts even when the ground is penetrated to a small depth in search (say) of lead ore, and it is not intended to go to any great expense, it is always wise to make a good provision at the surface. This is usually done by laying down on the ground a frame, square or rectangular, as may be necessary, with each of the beams longer than the angles of the square, projecting beyond so as to admit of the ends being safely pegged down or weighted with large stones. If the ground is not strong, it may be necessary to put in a second or a third of these frames, but without projecting extremities. Sometimes by way of security stringing laths are put in to hold these frames together. This makes the beginning of the shaft. In some districts a "barring," or series of thick planks, is put in, 2 ft. asunder, connected with stringing laths, so as to form a continuous protection. The boards are put in to protect the men when working below if the ground be very loose, and should be so placed that the joints do not occur regularly one over the other, but irregularly, so as to make their division less facile. [Mr. Smyth here exhibited a model of timbering as carried out in the Ulverstone and Cleator Moor districts.] I happened a few years ago to be on the spot just after two men had lost their lives for want of the simple precaution of laying the frame pieces in alternate lengths. The ground below gave way, the timber was forced in, and the joints being opposite each other, the whole mass came in bodily. The joints were opposite to each other, and thus opened without difficulty, the shaft collapsed, and let the whole mass down on the heads of the men below. When the shaft is to be opened of a considerable size, and the sinking carried steadily forward, and a site is selected which is secure from the chance of inundation, it will still be necessary to make some provision against the intrusion of surface water. Then the shaft should be well laid out, and kept as true to its rectangularity (and perpendicularity, if vertical) as possible. If inclined, its dimensions and regular angles ought to be carefully adhered to, although when shafts are sunk on the lode there is a natural temptation to be somewhat irregular if that is the character of the lode. This should be guarded against, because every deviation from the straight line is so much the worse for the winding machinery. The sets of timber will often have to be suspended from the surface until the rock is found of sufficient strength to form a foundation. For this purpose also strong bearers are put in, and let into the wall like stull pieces, lodged in niches on each side. Then struts are used at intervals of 3 or 4 ft., but if the ground be dangerous 18 in. or 1 ft. apart. In other cases the frames may have to be placed close together, in which case their strength is sufficient to resist very great pressures indeed. [The lecturer here exhibited a model of the great shaft at Clausthal, in which the timbers are supported by wall posts at the corners of the shaft, the struts being put diagonally, and measuring 12 to 14 in. in diameter.] The timbering of shafts is subject to a considerable amount of modification. Wherever the ground is difficult the general plan will, according to circumstances, have to be deviated from, but the principle will remain the same. The placing of the pumps, the ladders for locomotion, and the platforms or sollers in the shafts, must always be made subsidiary to rendering the shaft efficient and durable. Of course, a good deal will depend upon whether the shaft is intended ultimately for permanent use as to the nature and extent of the timbering. In Germany the first timbering put in is generally of quite a temporary character, but that is not so good a plan as putting in the permanent timbering at once. There are cases, however, in which temporary work is best, as, for instance, when the timbering is intended to be replaced by stone or brickwork on a foundation being arrived at below of sufficient strength for that purpose. The work, then, only differs in the strength of the timbering, the principle of suspension from above being indispensable until the foundation is reached, and the masonry is put into its intended position.

THE INSTITUTION OF CIVIL ENGINEERS.—At the meeting of this society, on Tuesday, Mr. Charles B. Vignoles, F.R.S. (President), in the chair, 23 candidates were duly elected, including 10 *Members*:—Mr. Horatio Brothers, engineer to the Equitable Gas Company, Pimlico; Mr. Richard Speiman Culley, engineer-in-chief of the Telegraph Department, General Post Office; Mr. John Gwynne, Hammersmith; Mr. Robert Handcock, Sydney, N.S.W.; Mr. Samuel Keefer, Brockville, Canada; Mr. Charles Martin, B.A., Cork; Mr. Wm. Mills, engineer to the London, Chatham, and Dover Railway Company; Mr. James Price, engineer to the Midland, Great Western, and the Great Northern and Western (of Ireland) Railway Companies; Mr. Edward James Reed, C.B., the Chief Constructor of the Navy; and Mr. Clifford Wigram, Blackwall. Thirteen gentlemen were elected *Associates*:—Mr. John George Crampton, Westminster; Mr. Henry James Galton, B.A., Engineer's Office, Trinity House; Mr. Henry James Burford Hancock, Temple; Mr. George Hodson, Surveyor to the Loughborough Local Board of Health; Mr. Henry Joll, P.W.D., Government of India; Mr. William George Laws, Newcastle-upon-Tyne; Mr. Richard Longlands, resident engineer East Indian Railway; Mr. John Marshman, general manager of the railways of Canterbury, N.Z.; Mr. William Morris, resident engineer of the Kent Water Works, Plumstead; Mr. William Powell, resident engineer, Harbour Works, Douglas, Isle of Man; Major Francis Ignacio Rickard, Government Inspector of Mines for the Argentine Republic; Captain Frederick Smith Stanton, R.E., officiating consulting engineer for railways in the provinces of Oudh and Rohilkund, India; and Mr. George Hunter Tait, executive engineer, Rajputana (State) Railway, Delhi.

SOCIETY OF ENGINEERS.—On Monday evening a paper will be read on "The Friction in the Steam-Cylinder," by Mr. Peter Jensen.

PRICES OF MATERIALS,

As charged at SPEARN MOOR MINE during the following months:—

Description.	Sept.	Oct.	Nov.
Hoop iron .....per cwt.	12s. 0d.....	12s. 0d.....	12s. 0d.
6-in. patent nails..... ,,	19 0	—	—
5-in. patent nails..... ,,	19 0	—	—
4-in. patent nails..... ,,	20 0	—	—
3-in. patent nails..... ,,	4 8	—	—
Norway timber .....per foot	0 9	—	—
Red pine timber..... ,,	—	1 1	—
Coals, including dues ..per ton	12 6	12 9	13 0
Best regd. candles* ..per doz.	5 9	—	5 9
Tallow* .....per cwt.	49 0	—	—
Grease* ..... ,,	14 0	—	—
Engine oil* .....per gal.	—	—	4 0
Powder* .....per 100 lbs.	33 0	33 0	33 0
Safety-fuse* .....per coil	—	0 4	—
Rope* ..... ,,	—	44 0	—
Hemp* .....per lb.	0 5	0 5½.....	—
White yarn* ..... ,,	0 5½.....	0 5½.....	—

* Delivered free of carriage.

CORNISH PUMPING ENGINES.—The number of pumping-engines reported for Jan. is 18. They have consumed 1403 tons of coal, and lifted 10·1 million tons of water 10 fms. high. The average duty of the whole is, therefore, 48,600,000 lbs., lifted 1 ft. high, by the consumption of 112 lbs. of coal. The following engines have exceeded the average duty:—

Cargoll—Michell's 72 in.	Millions	52·0
Chiverton Moor—70 in.		65·6
Dolcoath—Harriett's 60 in.		50·1
Great Work—Leed's 60 in.		53·6
North Wheal Crofty—Trevenson's 80 in.		56·6
Providence Mines—40 in.		52·2
South Wheal Frances—Marriott's 75 in.		49·1
West Wheal Seton—Harvey's 85 in.		66·6
Wheal Seton—Tregonning's 70 in.		69·1

ANNUAL REVIEW OF THE MATERIAL INTERESTS OF THE UNITED KINGDOM.—For many years past "The Railway, Banking, Mining, Insurance, and Commercial Almanack," edited by Mr. W. P. SMITH, has enjoyed a high reputation for the vast quantity of ably written and useful statistical matter contained, and the edition for the current year, which has just been issued, in every respect equal to its predecessors. There are original articles upon The Coal and Mineral Industries of Great Britain; The British Iron Trade in 1869; Life and Fire Insurance; Metropolitan Expansion and Social and Sanitary Requirements; the Operation of the New Law of Bankruptcy; Progress of Land and Building Societies; Difficulties of the British Cotton Trade; Trade and Finance; and Coal Imports and Exports; and each of these is really a record spective essay upon the progress which has been made in the several branches of industry during the year under consideration. A more useful almanack or annual than this could scarcely be required, and the character of the volume certainly far more accurately described by its new title—Annual Review of the Material Interests of the United Kingdom—than by that it has previously borne.

The NEW VADE MECUM (invented and manufactured by Charles H. Vincent, optician, of 23, Windsor-street, Liverpool) consists of a telescope so adapted for tourists, &c., to which is added an excellent microscope of great power and first-class definition, quite equal to others sold at ten times the price. Wonderful as it may seem, the price of this ingenious combination is only 3s. 6d., and Mr. Vincent sends it (carriage free) anywhere, with printed directions, upon receipt of Post Office order, or stamps, to the amount of 3s. 10d.

London: Printed by RICHARD MIDDLETON, and published by HENRY ENGLISH (the proprietors), at their offices, 26, FLEET STREET, E.C., where all communications are requested to be addressed.—*March 5, 1870.*